

Transforming Patient Care Through Telehealth (Presentation)

Joseph Tracy MS, BA

Lehigh Valley Health Network, Joseph.Tracy@lvhn.org

Terry A. Capuano MBA, MSN, RN, FACHE, NE-BC

Lehigh Valley Health Network, terry.capuano@lvhn.org

Anne Panik MS, RN, NEA-BC

Lehigh Valley Health Network, Anne.Panik@lvhn.org

Sharon Kromer CCRC, CTC

Lehigh Valley Health Network, Sharon.Kromer@lvhn.org

Lori Yesenofski MSN, RN, CCRN, CTC

Lehigh Valley Health Network, Lori.Yesenofski@lvhn.org

Follow this and additional works at: <http://scholarlyworks.lvhn.org/patient-care-services-nursing>



Part of the [Health and Medical Administration Commons](#), and the [Nursing Commons](#)

Published In/Presented At

Tracy, J. & Capuano, T. (2013, October 2-4). *Transforming patient care through telehealth*. Presented at: The American Nurse Credentialing Center's National Magnet Conference, Orlando, FL.

Yesenofski, L., Kromer, S., Tracy, J. (2014, June). *Transforming Patient Care Through Telehealth*. Presented at the Philadelphia Area Magnet Consortium's Sixth Annual Magnet Champions Conference, Philadelphia, PA.

Transforming
Patient Care
through
Telehealth



**Lehigh Valley
Health Network**

A PASSION FOR BETTER MEDICINE.™

Transforming
Patient Care
through
Telehealth

Terry Capuano, MBA, MSN, RN, FACHE

Chief Operating Officer

Lehigh Valley Health Network, Allentown, PA



**Lehigh Valley
Health Network**

A PASSION FOR BETTER MEDICINE.™



Lehigh Valley Health Network

A PASSION FOR BETTER MEDICINE.™

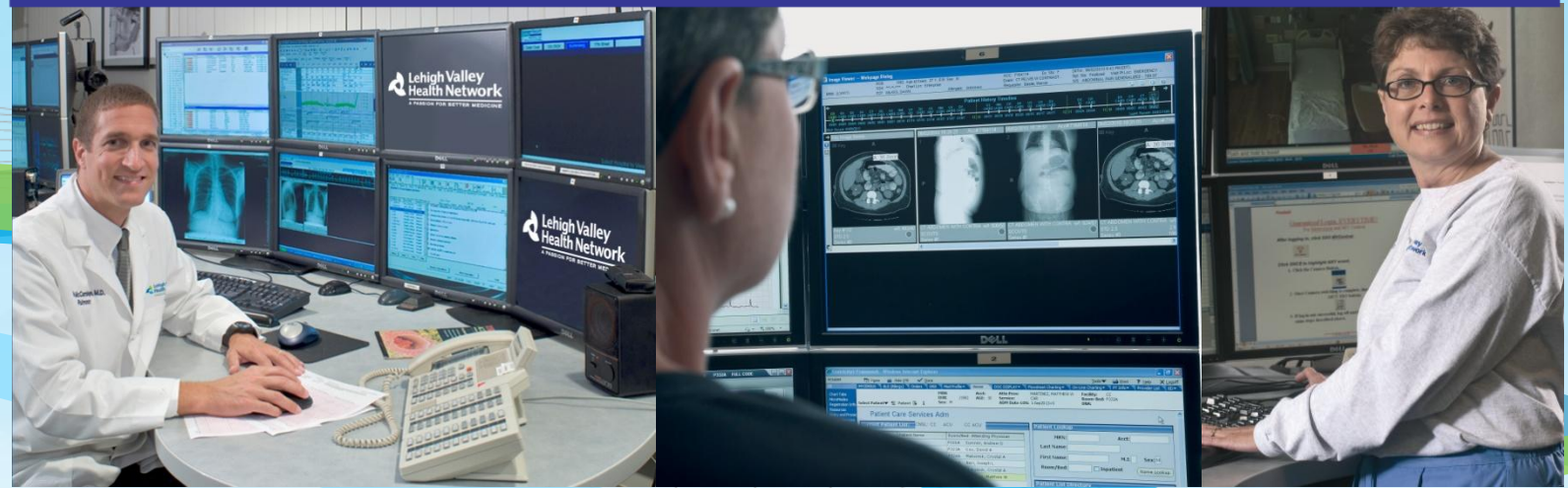




children's hospital
LEHIGH VALLEY HEALTH NETWORK
a service of Lehigh Valley Hospital

Health Center at Macungie
LEHIGH VALLEY HEALTH NETWORK
PHYSICIAN SERVICES NOW OPEN

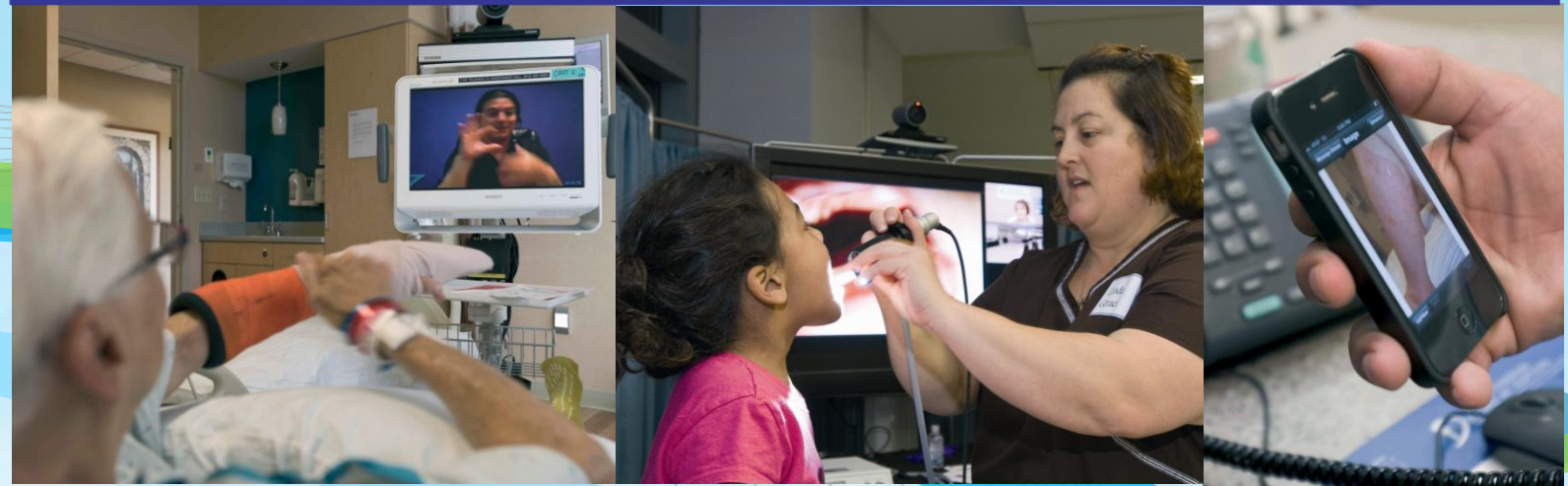
Transforming Patient Care through Telehealth



LVHN Telehealth Services – 2002-2013



Transforming
Patient Care
through
Telehealth



Transforming Patient Care through Telehealth



Cautious Believer

Transforming
Patient Care
through
Telehealth



Transforming
Patient Care
through
Telehealth

Joseph Tracy, MS, BA

Vice President, Telehealth

Lehigh Valley Health Network, Allentown, PA



**Lehigh Valley
Health Network**

A PASSION FOR BETTER MEDICINE.™

RADIO NEWS

REG. U. S. PAT. OFF.

25 Cents
April
1924
Over 200 Illustrations

Edited by H. GERNSBACK

THE RADIO DOCTOR—*Maybe!*

See Page 1406



IN THIS ISSUE:
Sir Oliver Lodge, F.R.S.
Dr. J. A. Fleming, F.R.S.
F. W. Dunmore and
F. H. Engel of
Bureau of Standards
Howard S. Pyle
Brainard Foote

THE 100% RADIO MAGAZINE





Lehigh Valley Hospital Teleburn

Instructions

1. Complete required fields
2. Use the **"Browse"** button to select the pictures you want to send
3. Hit the **"Submit"** button to send the pictures to LVHN
4. Upon successful transmission, call **610-402-BURN**

Facility	<input type="text" value="Hazleton"/>
Patient Last Name	<input type="text" value="Test"/>
Patient First Name	<input type="text" value="John"/>
Patient Middle Initial	<input type="text" value="A"/>
Birth Date	<input type="text" value="06/25/2004"/>
Date of Injury	<input type="text" value="06/05/2009"/>
Burn Type	<input type="text" value="CONTACT"/>
Referring Physician	<input type="text" value="Wheary"/>
Submitted by	<input type="text" value="Tracy"/>

* Fields in **RED** are required for submission

* **Three files MAX**

Files:
C:\Documents and Settings\b6610\My Documents\My Pictures\John Test Contact
Burn.jpg

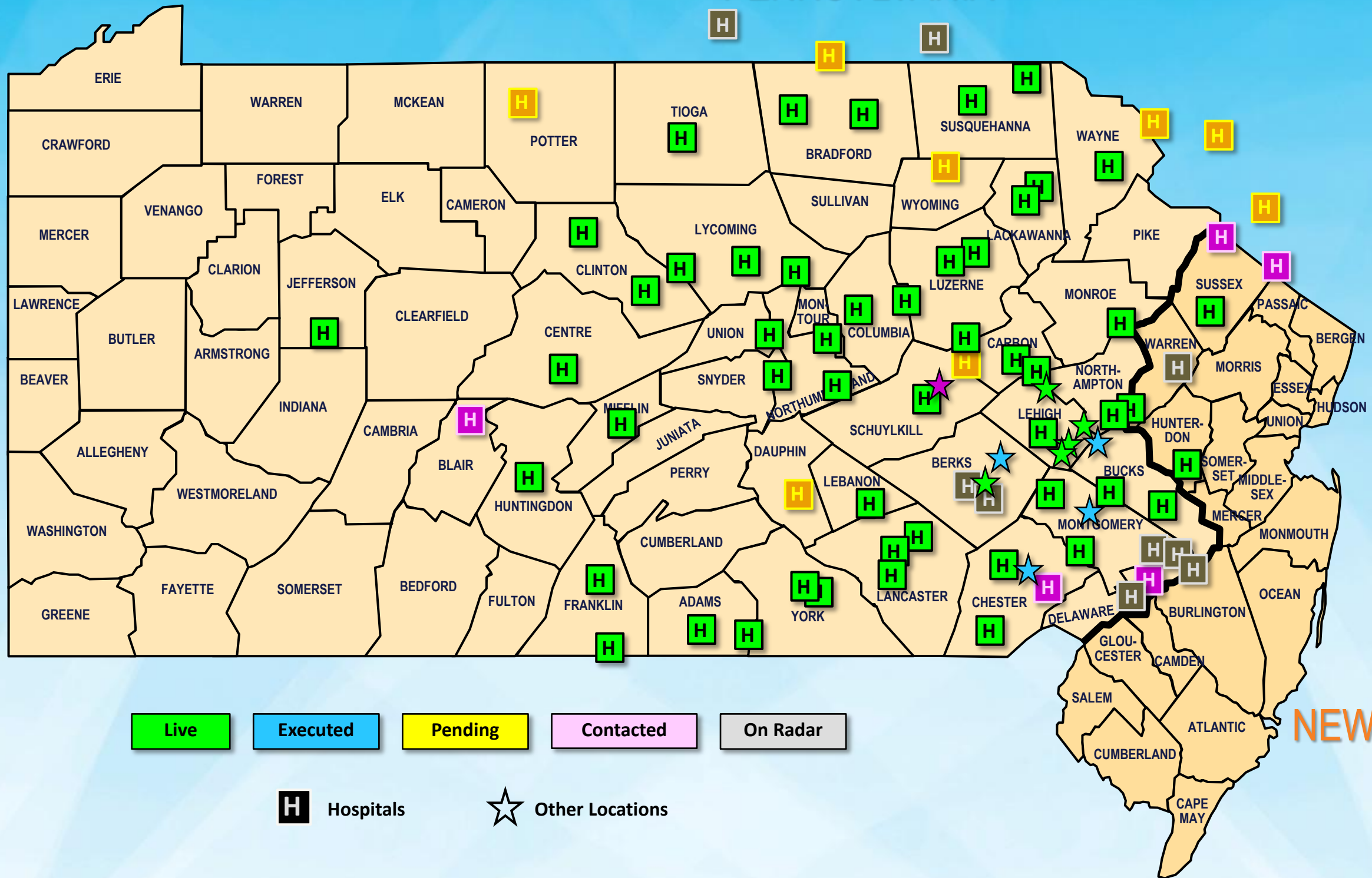


Transforming
Patient Care
through
Telehealth



TeleBurnSM

PENNSYLVANIA

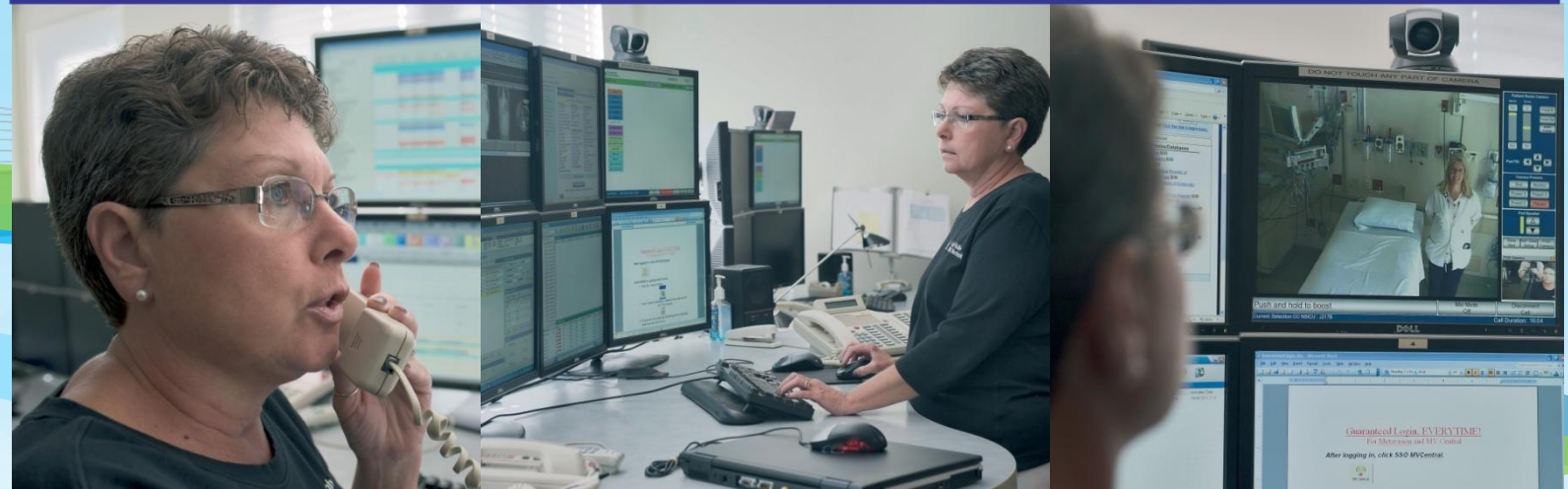


NEW JERSEY

Transforming
Patient Care
through
Telehealth



Transforming Patient Care through Telehealth



Advanced Intensive Care Unit

30% Reduction in Mortality

ORIGINAL INVESTIGATION

Association of Health Information Technology and Teleintensivist Coverage With Decreased Mortality and Ventilator Use in Critically Ill Patients

Matthew McCambridge, MD; Kari Jones, PhD; Hannah Paxton, RN, MPH; Kathy Baker, RN, MPH; Elliot J. Sussman, MD; Jeff Etchason, MD

Background: Little evidence exists to support implementing various health information technologies, such as telemedicine, in intensive care units.

Methods: A coordinated health information technology bundle (HITB) was implemented along with remote intensivist coverage (RIC) at a 727-bed academic community hospital. Critical care specialists provided bedside coverage during the day and RIC at night to achieve intensivist coverage 24 hours per day, 7 days per week. We evaluated the effect of HITB-RIC on mortality, ventilator and vasopressor use, and the intervention length of stay. We compared our results with those achieved at baseline.

Results: A total of 954 control patients who received care for 16 months before the implementation of HITB-RIC and 959 study patients who received care for 10 months after the implementation were included in the analysis. Mortality for the control and intervention groups were

21.4% and 14.7%, respectively. In addition, the observed mortality for the intervention group was 75.8% ($P < .001$) of that predicted by the Acute Physiology and Chronic Health Evaluation IV hospital mortality equation, which was 29.5% lower relative to the control group. Regression results confirm that the hospital mortality of the intensive care unit patients was significantly lower after implementation of the intervention, controlling for predicted risk of mortality and do-not-resuscitate status. Overall, intervention patients also had significantly less ($P = .001$) use of mechanical ventilation, controlling for body-system diagnosis category and severity of illness.

Conclusion: The use of HITB-RIC was associated with significantly lower mortality and less ventilator use in critically ill patients.

Arch Intern Med. 2010;170(7):648-653

Author Affiliations: Divisions of Critical Care Medicine (Dr McCambridge) and General Internal Medicine (Drs Sussman and Etchason), Department of Community Health, Health Studies, and Education (Drs Jones and Etchason and Mrs Paxton and Baker), Lehigh Valley Health Network, Allentown, Pennsylvania; Department of Medicine, Penn State College of Medicine, Pennsylvania State University, Hershey (Dr McCambridge); and Department of Medicine, College of Medicine, University of South Florida, Tampa (Dr Sussman).

BECAUSE OF THE COMPLEXITIES of caring for critically ill patients, as well as an ongoing shortage of intensive care unit (ICU) specialists, a number of promising technologies are being advanced in the hope that they can support the provision of higher-quality, more efficient care to an increasing number of patients. The number of studies of several types of health information technology (HIT), such as telemedicine and computer-assisted physician order entry, among others, is limited and results have been mixed. Very little evidence exists related to the effect of some of these technologies, specifically in ICU settings,^{8,9} and, furthermore, how they might function together as an integrated package or bundle to improve the quality of care. Given the considerable expense of implementing such technologies, this lack of evidence represents a significant barrier to their adoption.

To date, the most convincing evidence to guide quality improvements in ICU settings pertains to physician specialty training and medical staffing. A substantial body of evidence demonstrates improvements in outcomes for ICU patients who receive care from specially trained and certified critical care physicians (intensivists),¹⁰⁻¹⁶ in which management of all ICU patients is transferred to intensivists, produce better outcomes than open models, in which intensivists manage some or none of the patients.¹⁶⁻²¹

Although the evidence for closed ICUs is compelling, whether to have intensivists present in the ICU on a continuous basis is still an unsettled issue for many experts.²²⁻²⁴ Despite equivocal evidence, there is pressure from organizations such as the Leapfrog Group²⁵ to provide continuous coverage by intensivists in closed ICUs. However, the proponents of this goal admit that its attainment is challenged by an

ongoing shortage of specially trained and credentialed intensivists. To make matters worse, with only 10% to 20% of ICUs staffed by dedicated intensivists,^{26,27} the current shortage will likely become exacerbated.²⁸⁻³⁰

This workforce dilemma has led to speculation that HIT might help expand patients' access to high-quality critical care medicine,²¹ in fact, remote ICU telemonitoring by intensivists is being used in a limited number of institutions to fill gaps in staffing coverage. However, the evidence for the effectiveness of doing so, much like other technologies such as computer-assisted physician order entry, is still preliminary and limited.² Only 3 studies³¹⁻³⁴ of remote ICU telemonitoring have emerged in the peer-reviewed literature. Two of those studies^{32,33} demonstrated improvements in mortality and length of stay (LOS), while the third³⁴ reported no overall effect on either outcome. However, all 3 of these previous studies share the limitation of not having used a closed ICU staffing model as the baseline comparator. Hence, the existing evidence does not address the question of whether advanced HIT, including telemedicine applications, can effectively improve outcomes in ICUs with use of a closed staffing model, ie, the model whose use is considered to be evidence-based best practice.

This article reports the results of installing a health information technology bundle (HITB) in conjunction with remote intensivist coverage (RIC). We conducted a study to evaluate the effectiveness of HITB-RIC with respect to mortality, ventilator and vasopressor use, and LOS. We compared the results of this intervention with those achieved at baseline by a closed ICU staffing model without HIT enhancements and 24 hours per day, 7 days per week on-site coverage.

METHODS

STUDY DESIGN

We conducted an interrupted time series observational study. This study was deemed exempted research by the institutional review board of Lehigh Valley Health Network.

STUDY POPULATION

Patients were included in the study if they were aged 18 years or older and had been admitted to an ICU for a medical diagnosis the first admission to the ICU during hospitalization. The control group consisted of patients admitted consecutively to the ICU for 16 months preceding the implementation of HITB-RIC, which began January 1, 2004, and was completed September 30, 2004. The study group consisted of patients admitted consecutively to the ICU for the 10 months after implementation had been completed.

HITB-RIC INTERVENTION

The study was conducted in 3 ICUs that contained a total of 400 beds, all part of a 727-bed academic community hospital. Two of the ICUs shared staff and management, whereas the third had a separate staff and nurse manager but operated in the same manner as the other 2 ICUs with respect to work hours, protocols, and standards of care. During

the study, no changes occurred in the physical layout of the units, nursing staff ratios, or unit structure. Before the implementation of HITB-RIC, the ICU was a closed model staffed 7 AM to 11 PM, with call coverage during off hours.

With the goal of increasing intensivist coverage to 24 hours a day, a team of caregivers, administrators, and information systems experts worked for approximately 12 months to implementing process, project leaders ensured that the eventual bundle would serve to improve their ability to treat patients and not disrupt their workflow.³⁵ The implementation team determined that all components of HITB-RIC were necessary for the successful reengineering of ICU care. Therefore, all components were selected as part of an integrated program of care enhancement. The HITB-RIC consisted of an ICU electronic medical record (EMR) with an electronic algorithmic event system (MetaVision and MVcentral; iMDSoft, Needham, Massachusetts); computer-assisted physician order entry, an electronic medication administration record, and barcoded medication administration (LastWord; GE Healthcare, Fairfield, Connecticut); a radiographic picture archiving and communication system (Centricity RIS-IC; GE Healthcare); and a 2-way audio and 1-way video remote monitoring system (Vistacom Inc, Allentown, Pennsylvania).

The telemedicine team (an intensivist and a critical care nurse), located off-site, used the audiovisual equipment in each ICU room to interact with patients and caregivers and had real-time access to all the components of the HITB, including the EMR, current and prior medical transcriptions, and ancillary data (LastWord; GE Healthcare). From 7 PM to 7 AM, the telephone calls from ICU nurses about their patients, and responded to computer-generated events, as identified by the EMR's algorithmic event system. These events included, but were not limited to, critical changes in heart rate, blood pressure, laboratory values, mechanical ventilator parameters, and central venous and pulmonary artery catheter values. The telemedicine team also responded to radiographic abnormalities for all monitored patients every 2 hours, proactively looking for changes in clinical status that would warrant intervention.

DATA

Data were collected with regard to 1000 control and 1000 study patients. For the controls, demographic information was obtained from administrative records and clinical data were manually abstracted from medical records. Data regarding HITB-RIC were retrieved from the MetaVision database and entered for all patients' first 24 hours of ICU stay were obtained from the medical record and used to calculate each patient's Acute Physiology and Chronic Health Evaluation (APACHE) Score (APS).³⁶ The APS is part of the APACHE IV hospital mortality equations (hereafter, APACHE IV),³⁷ which comprise the hospital mortality among critically ill patients. Patients were assigned body-system diagnostic categories according to the APACHE IV classification system contained in the calculation template.

APACHE APS and APACHE IV have not been validated for patients with burn diagnoses, patients staying in the ICU less than 4 hours, or patients transferred from other ICUs.³⁸⁻³⁹ Two study patients had burn diagnoses; 18 control and 3 study patients stayed less than 4 hours in the ICU and were, therefore,

1. Demographic and Clinical Characteristics of Patient Sample

Characteristic	Control Group (n=954)	HITB-RIC Group (n=959)	P Value
Age, mean (SD)	65.0	64.4	
Sex, No. (%)	476 (49.9)	478 (49.8)	.38 ^a
Ethnicity, No. (%)			.98 ^b
APACHE IV score	860 (90.1)	831 (86.7)	
APACHE IV score, No. (%)	19 (2.0)	31 (3.2)	
APACHE IV score, No. (%)	36 (3.8)	43 (4.5)	.16 ^b
APACHE IV score, No. (%)	4 (0.4)	4 (0.4)	
APACHE IV score, No. (%)	35 (3.7)	50 (5.2)	
ICU category, No. (%)			
ICU category, No. (%)	296 (31.0)	190 (19.8)	
ICU category, No. (%)	35 (3.7)	38 (4.0)	
ICU category, No. (%)	175 (18.3)	178 (18.4)	
ICU category, No. (%)	182 (19.1)	310 (32.3)	<.001 ^b
ICU category, No. (%)	239 (25.1)	212 (22.1)	
LOS, mean (SD)	27 (2.8)	33 (3.4)	
LOS, mean (SD)	56.9 (27.7)	58.4 (26.7)	.17 ^a
LOS, mean (SD)	19.9	19.4	.62 ^a

APACHE IV, Acute Physiology and Chronic Health Evaluation; LOS, length of stay; RIC, remote intensivist coverage.

^aAPACHE IV and APACHE IV score were used for analysis. We used nonparametric tests were used for analysis. We used nonparametric tests were used for analysis.

^bControl and HITB-RIC patients significantly differ with respect to mortality. We used nonparametric tests were used for analysis.

^cControl and HITB-RIC patients significantly differ with respect to LOS. We used nonparametric tests were used for analysis.

^dControl and HITB-RIC patients significantly differ with respect to LOS. We used nonparametric tests were used for analysis.

^eControl and HITB-RIC patients significantly differ with respect to LOS. We used nonparametric tests were used for analysis.

^fControl and HITB-RIC patients significantly differ with respect to LOS. We used nonparametric tests were used for analysis.

^gControl and HITB-RIC patients significantly differ with respect to LOS. We used nonparametric tests were used for analysis.

^hControl and HITB-RIC patients significantly differ with respect to LOS. We used nonparametric tests were used for analysis.

ⁱControl and HITB-RIC patients significantly differ with respect to LOS. We used nonparametric tests were used for analysis.

^jControl and HITB-RIC patients significantly differ with respect to LOS. We used nonparametric tests were used for analysis.

^kControl and HITB-RIC patients significantly differ with respect to LOS. We used nonparametric tests were used for analysis.

^lControl and HITB-RIC patients significantly differ with respect to LOS. We used nonparametric tests were used for analysis.

^mControl and HITB-RIC patients significantly differ with respect to LOS. We used nonparametric tests were used for analysis.

ⁿControl and HITB-RIC patients significantly differ with respect to LOS. We used nonparametric tests were used for analysis.

MAIN OUTCOME MEASURES

We analyzed the effect of HITB-RIC on several outcome variables. The primary outcome of interest was hospital mortality. Secondary outcome measures were mechanical ventilator and vasopressor use (both measured dichotomously as used or not used) and ICU and hospital LOS. Control variables included the severity of illness, diagnosis, and do-not-resuscitate (DNR) status.

STATISTICAL ANALYSIS

APACHE IV was used to calculate the standardized mortality ratio (SMR). The SMR is calculated as the observed hospital mortality of the study sample divided by the average hospital predicted mortality ratio.³⁸⁻³⁹ To test the statistical significance of differences in observed vs predicted mortality, we used a simple comparison of the observed proportion of mortalities to the predicted benchmark proportion because SMRs in general are not comparable to one another.

We used binary logistic regression to explore the difference in mortality before and after HITB-RIC, controlling for risk factors in use of ventilators and vasopressors before and after HITB-RIC were explored with binary logistic regression, controlling for severity of illness (APACHE APS), body-system diagnostic category, and DNR status (and substituted do-not-intubate status for DNR status in ventilator use analysis). Differences in hospital and ICU LOS were explored by regression analysis, controlling for severity of illness (APACHE APS) and body-system diagnostic category.

We also used an interrupted time series design to analyze outcomes over time to control for trends in study outcomes that may have started in the period before HITB-RIC. Because mortality and ventilator use are relatively rare, rates of each were meaningful only for 1 month or longer. Rates of each were series with monthly observations. However, we analyzed time series with monthly observations. However, we analyzed time series with monthly observations. However, we analyzed time series with monthly observations. However, we analyzed time series with monthly observations.

RESULTS

No statistically significant differences ($\alpha = .05$) were found between the 2 groups with respect to demographic characteristics or clinical measures except diagnostic category (Table 1). Overall, we observed a decrease in crude mortality from 21.4% in the control period to 14.7% in the study period. During the control period, mortality was not significantly different from the predicted mortality (SMR, 1.075). However, during the study period, observed mortality was significantly different from the predicted mortality (SMR, 0.758) (Table 2). The HITB-RIC group SMR was 29.5% lower than the control group SMR. Holding APACHE IV (which also controls for diagnosis) and DNR status constant, regression analysis demonstrates that HITB-RIC group mortality was not only significantly less than predicted (as shown by the SMRs) but also significantly less than the control group mortality (Table 3).

Transforming Patient Care through Telehealth



Transforming
Patient Care
through
Telehealth

Anne Panik, MS, BSN, RN, NEA-BC

Senior Vice President, Patient Care Services

Lehigh Valley Health Network, Allentown, PA



LVHN Telehealth

17,000+ patients cared
for in 2012

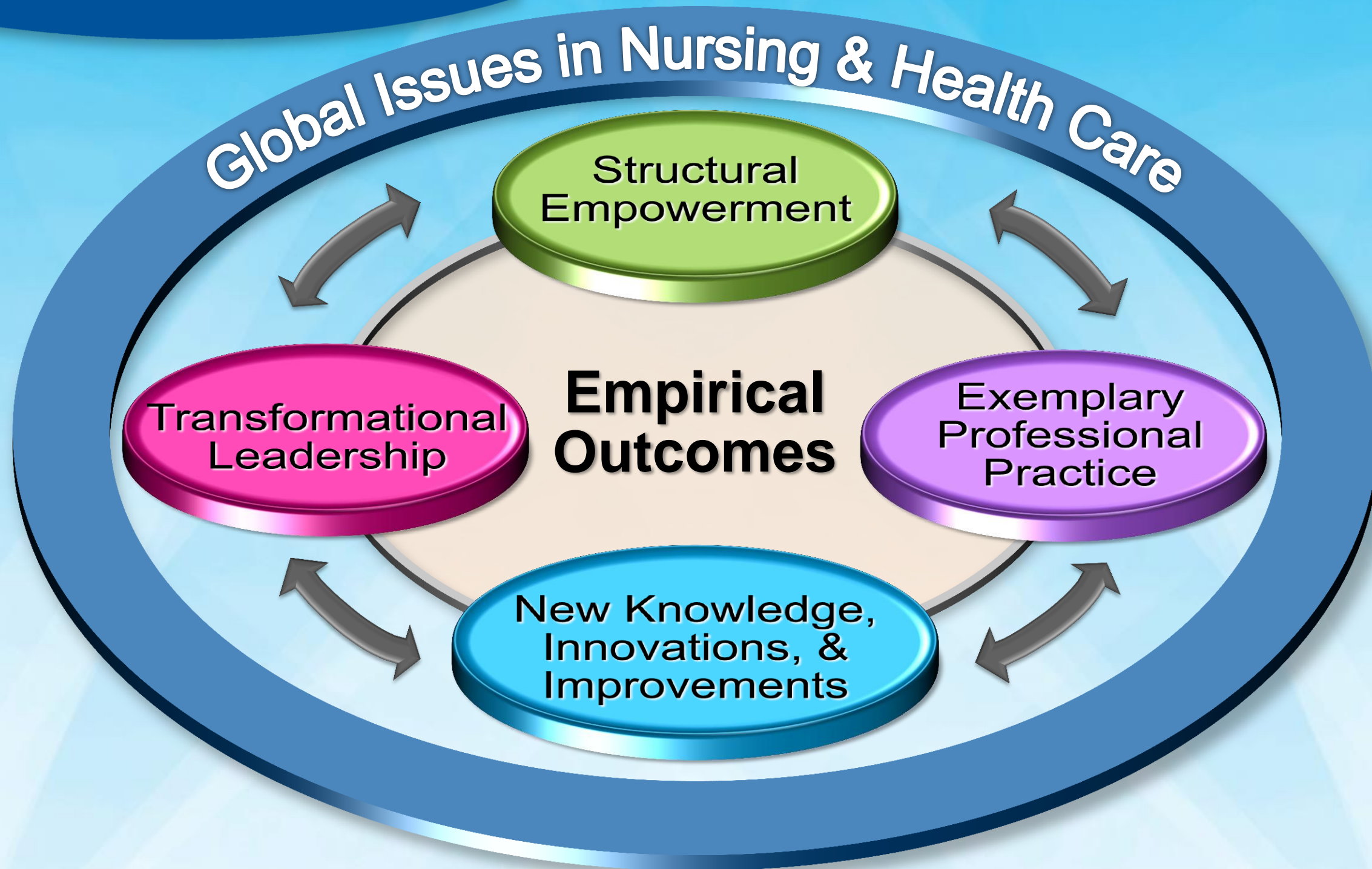


Transforming Patient Care through Telehealth



Telehealth: Benefits to Nursing

Magnet Model



Telehealth Outcomes

- Increased utilization volumes
- Enhanced process efficiencies and effectiveness
- Improved clinical outcomes
- Improved utilization of resources
- Reduced costs
- Enhanced access to care
- Increased patient satisfaction

Tele-ID Outcomes

N = 458 patients





Transforming
Patient Care
through
Telehealth



Step:

1 Involve a nurse!

Step:

2 Research the need

Step:

3 Explore the technologies

Transforming Patient Care through Telehealth





Lehigh Valley Health Network

A PASSION FOR BETTER MEDICINE.™

For More Information: lvhn.org/telehealth